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California Redwood *for the* **ENGINEER**



McNeill

CALIFORNIA
REDWOOD
FOR THE
ENGINEER



(1917)

CALIFORNIA REDWOOD ASSOCIATION
SAN FRANCISCO

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by
California Redwood Association



Station of the Northwestern Pacific R. R. at Willits, California. Built throughout of California Redwood

Engineering and Railroads

REDWOOD'S resistance to rot is recognized as standard by railroad, mining, and construction engineers, and Redwood is extensively used by them for a great variety of such purposes. It is specially suited for tanks, pipe lines, flumes, timbers, irrigation and drain boxes, concrete forms, lagging, etc.

Railroad Uses

Some of the many railroad uses for Redwood are:

FOR EQUIPMENT

Refrigerator Car Roofing.
Stock Box and Metal Covered Roof.
Siding for Freight Equipment.
Siding for Outside Frame Box Cars.
Baggage and Express Moulding, Casing, Lining, and Sheathing.

Passenger Equipment Car Bottom Lining.

Inside Lining for Freight Equipment Cars (except refrigerator cars).

Lining and Ceiling for Refrigerator Cars.

Passenger Car Outside Sheathing and Panels

Letter Boards.

Moulding.

Postal Car Lining and Ceiling.

Baggage and Express Car Ceiling.

Eave Facia Moulding.

WILL NOT SHRINK, SWELL OR WARP

C A L I F O R N I A R E D W O O D

JC

ADDRESSED TO: Hobart Building
San Francisco.

FORM 3010

STANDARD
12-16-2000

SOUTHERN PACIFIC COMPANY.

OFFICE OF CHIEF ENGINEER.

1136 James Flood Bldg., San Francisco, Calif.
February 10th, 1917.

Dear Sir:-

Southern Pacific Company uses redwood ties by preference to any other ties available on the Pacific Coast.

Our ordinary consumption is from 750,000 to 1,000,000 redwood ties per year, perhaps an average of about 900,000 for maintenance of track (tie renewals).

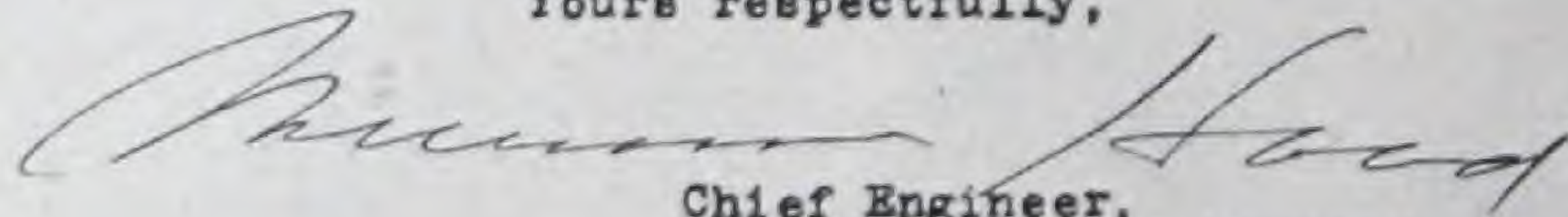
With Southern Pacific Company rolling stock in use at present we always tie plate redwood ties, and also tie plate other ties, excepting on unimportant branch lines.

Some years ago when the weight on engine driving wheel axles was about one-half what it is now, we did not tie plate redwood ties.

The life of redwood ties in track is variable as affected by decay, dependent upon the local conditions, character of soil and rainfall, etc., but the redwood tie under any conditions is the most durable tie available here.

I have known redwood ties to be in use in main line track as long as 22 years, and the average redwood tie under all conditions can be relied on with us for about 12 years, perhaps more.

Yours respectfully,


Chief Engineer,
Southern Pacific Company.

Redwood tie is most durable

R E S I S T S F I R E A N D R O T



NORTHWESTERN PACIFIC RAILROAD COMPANY

W. S. PALMER
PRESIDENT AND GENERAL MANAGER
N. W. P. BUILDING
64 PINE ST., SAN FRANCISCO

(COPY)

April 29, 1914.

Dear Sir:

Practically all of the tracks of the Northwestern Pacific Railroad Company, some 500 miles, are laid with redwood ties. Many of the ties which were used in the original construction of the lines ultimately consolidated into the Northwestern Pacific, were in the track 18 to 20 years before removal. When built, 50 and 56-pound rail was laid upon these ties without tie plates. Upon tangents and upon branch lines where the traffic was light, some of these ties were taken out of the track at the end of 25 years practically sound so far as decay was concerned. However, through adzing on account of outer rail of curve rolling, and frequent re-spiking for gauge, the ties had become useless.

In 1908, the Northwestern Pacific replaced old 56-pound steel between Cloverdale and Ukiah with heavy rail, and at that time many of the ties replaced were those laid in this track in 1889.

At present, the Northwestern Pacific is using a 6 x 8" redwood tie, with Harriman Lines' flat tie plate, 8 x 8½", weighing 6.36 pounds, and believe that such ties will give from 12 to 15 years of service except where laid on sharp curves. We are operating over this track ten-wheel engines with driving wheel load of 134,000 pounds, total loaded weight of engine, 176,000 pounds, and the tie plates in five years have no more than bedded themselves in the tie.

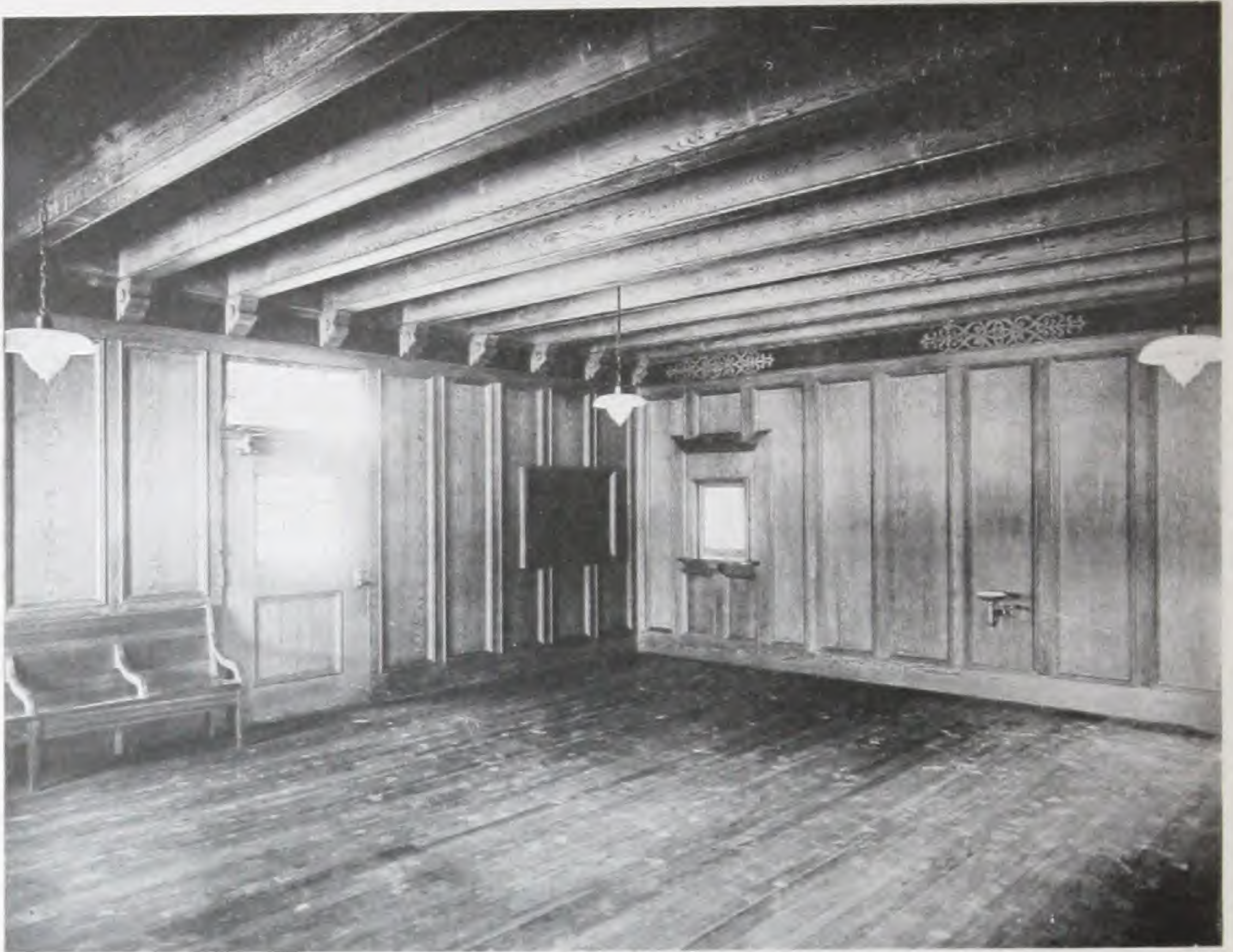
Considering the durability of the wood, and with proper tie plate protection under rail of adequate weight and size for the power used, we believe a redwood tie of the size above mentioned gives better service than a 7 x 9" tie of less durable woods.

Yours truly,

(Signed) W. S. PALMER.

Life of Redwood ties 18 to 25 years on this road

WILL NOT SHRINK, SWELL OR WARP



Interior of railroad station at Willits, California. Finished with Redwood

BRIDGES, CULVERTS AND TRESTLES

Foundation Timbers.
Cross Ties for Bridges.
Mud Sills.
Trestle, Caps, Posts, and
Sills.
Cribbing.
Posts.

MOTIVE POWER

Lagging for Locomotive
Boilers.
Boxing, Temporary Grain
Doors and Ordinary
Work.
Cabinet.
Office Case Work, etc.
Patterns.
Inside Finish in Buildings.
Cornices.

Window and Door Facings.
Sign Boards.
Wide Mouldings.
Sash.
Cabinet Work.
Insulating Boards and Wall.
Ceiling of Refrigerator and
Freight Cars.
Passenger Car Ceiling.
Stripping for Powder Cars.

ROADWAY

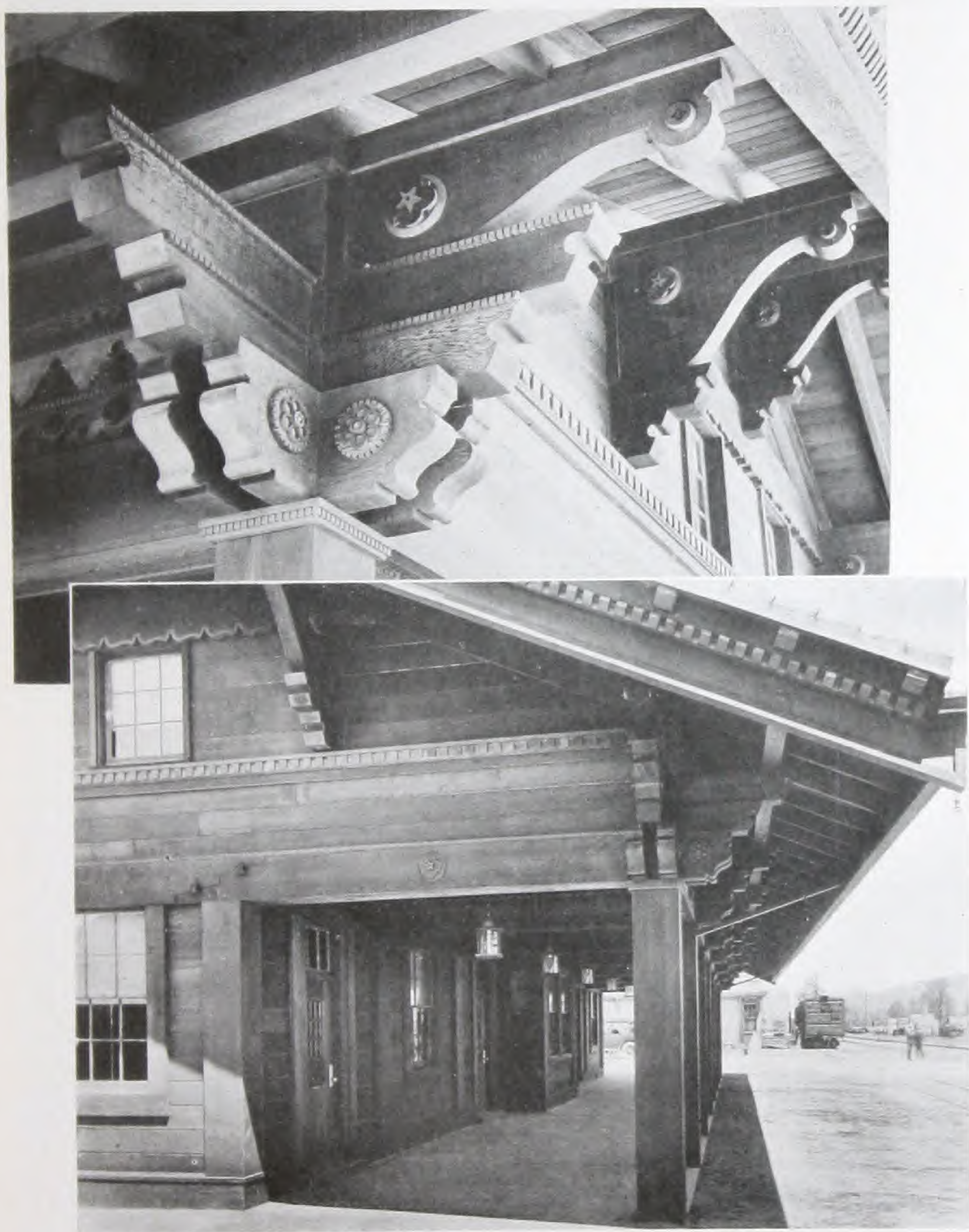
Ties.
Fence Boards.
Flumes.

POSTS

Line and Lamp Posts
(Electrical Dept.).
Fence Posts.
Sign Posts.
Signal Posts.

R E S I S T S F I R E A N D R O T

CALIFORNIA REDWOOD



Views of railroad station at Willits, California, showing Redwood construction details

WILL NOT SHRINK, SWELL OR WARP



The beautiful interior of the city ticket office of the Santa Fe Ry. at Los Angeles. All Redwood and a striking example of the exquisite decorative effects possible with this remarkable wood

BUILDINGS

Ceiling.
Foundation Timbers.
Sheathing and Under-
flooring.
Wainscot.
Shingles.
Barn Siding.
Drop and Lap Siding.

MAINTENANCE

Cribbing.
Finishing Lumber.
Signs.

WATER TANKS

Staves and Bottoms.

SIGNAL DEPT.

Trunking and Capping

Redwood does not have to be treated with artificial preservatives to prolong its life. Nature impregnated

Redwood with a natural preservative that grew into the wood. For engineering purposes in contact with ground or moisture, Redwood can be depended upon to maintain its full strength and service from 15 years upward.

Redwood Railroad Ties

The hardest possible service to which wood can be subjected is the railway tie.

It is not only in constant contact with the ground, but it must stand the strain and stresses of swiftly-moving heavy trains. In his report on "Timber; An Elementary Discussion of the Characteristics and Properties of Wood," to the Division of Forestry, U. S. Department of Agriculture, Filbert Roth, special agent in

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charge of timber physics, gives the following table on

THE RANGE OF DURABILITY
IN RAILROAD TIES

	YEARS
Redwood	12
Black Locust	10
Cypress and Red Cedar ...	10
Oak (white and chestnut) .	8
Chestnut	8
Tamarack	7 to 8
Cherry, Black Walnut Locust	7
Elm	6 to 7
Long Leaf Pine	6
Hemlock	4 to 6
Spruce	5
Red and Black Oaks ...	4 to 5
Ash, Beech, Maple	4

To get best service out of the Redwood tie under heavy equipment tie plates should be used.

Redwood ties are in big demand in South America, England and the

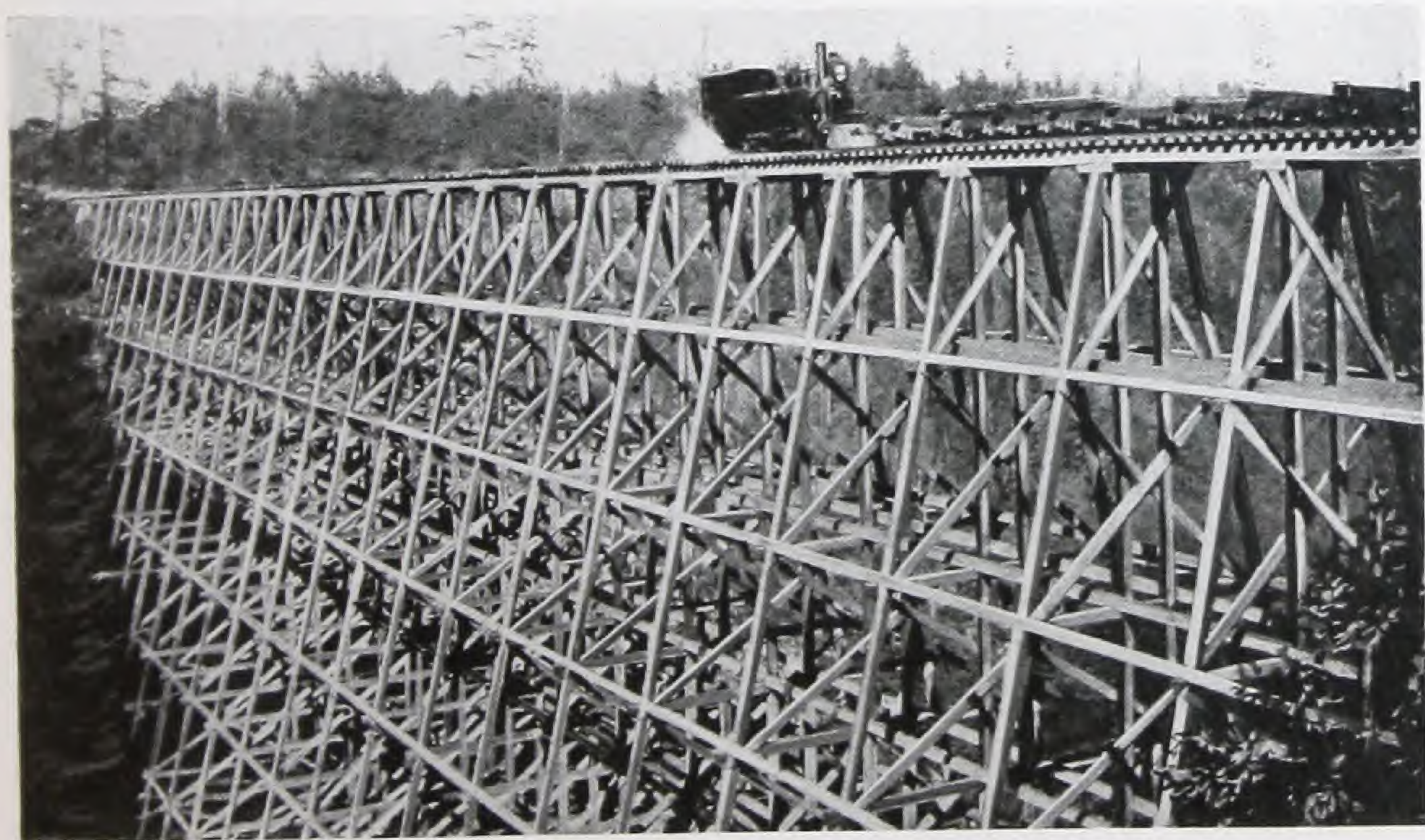
continent, Australia and the Orient, because of its resistance to decay and resistance to attack of destructive insects so common in the tropical countries.

Car Siding, Stations, Etc.

Redwood is splendidly adapted for car siding and roofing because it is sufficiently strong, light in weight, does not shrink, swell or warp, is hard to set on fire and burns very slowly, is not subject to wet or dry rot, and takes and holds paint perfectly.

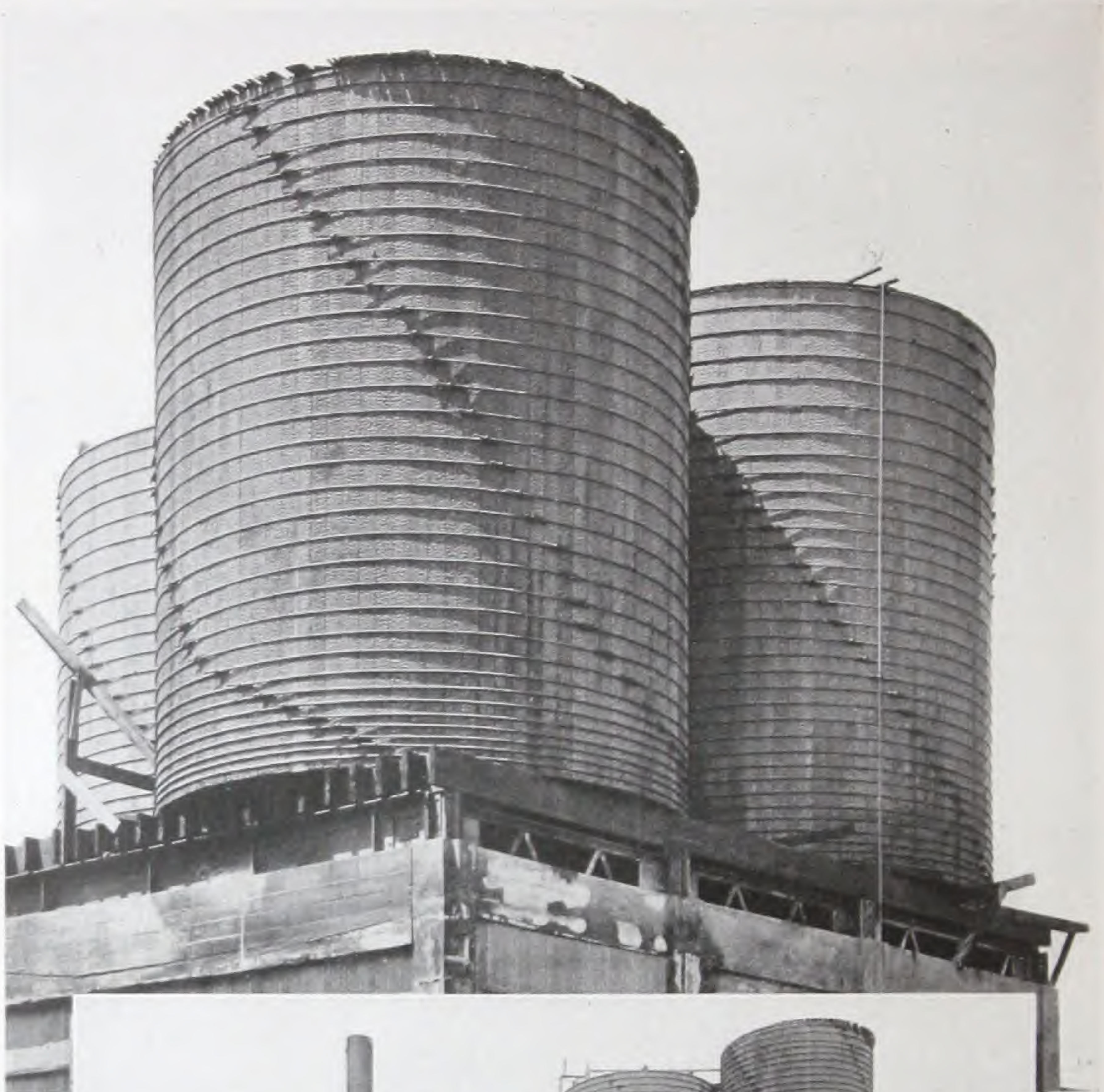
The absence of shrink or swell is particularly desirable for car siding and roofing because of the travel of the car through varying climatic conditions.

Redwood is generally specified for railroad stations in the western country because of its extreme durability in contact with the ground and exposure to the weather, its satisfactory painting surface and its fire resist-



Railroad trestle, 640 feet long and 144 feet high, built entirely of Redwood

WILL NOT SHRINK, SWELL OR WARP



Redwood water tanks are capable of withstanding severe fires, as evidenced by above photographs. The two charred tanks are Redwood, and went without damage through the fire which destroyed the plant of J. Allec, New Parisian Dyeing and Cleaning Works, San Francisco. The third tank of another wood had to be entirely replaced

ance. Redwood is specified for such work to reduce the upkeep cost on small stations.

Tanks and Vats

Redwood makes a superior stave for tanks.

Redwood is a non-conductor of heat and cold; 2 inches of Redwood is equivalent in insulating power to approximately 30 inches of steel or concrete. This is an element of high importance in the stave for this use because it preserves the temperature of the contents of the tank.

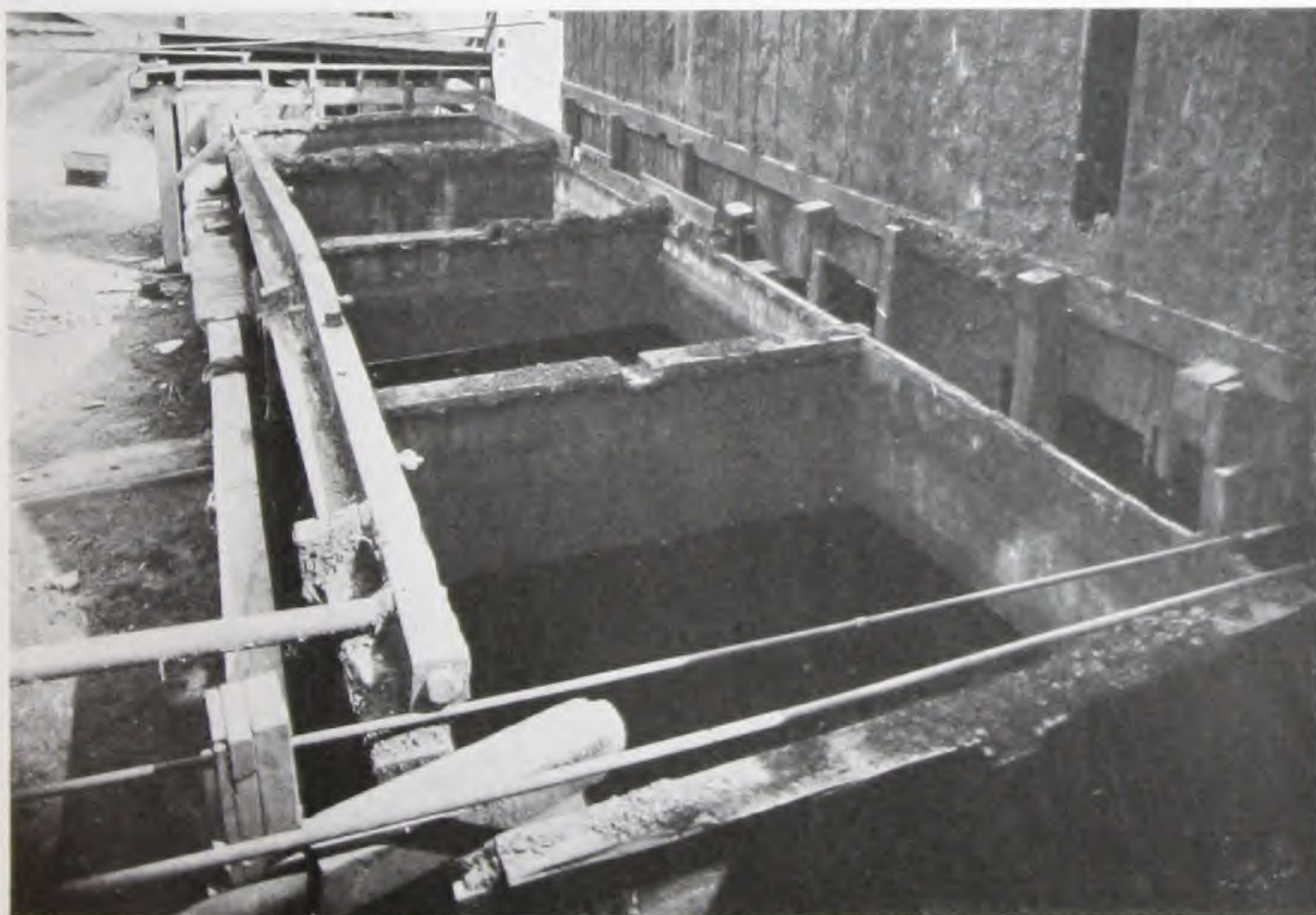
Redwood staves are made from clear heart straight-grain stock and come in standard sets of 6 to 9 and 10 to 20 feet in length.

Redwood's long life and its resistance to decay or corrosive acids and alkalis make it extremely valuable for

tanks. Redwood tanks can handle muriatic acid solutions up to 6 per cent, and up to 28 per cent of nitrohydrochloric acid.

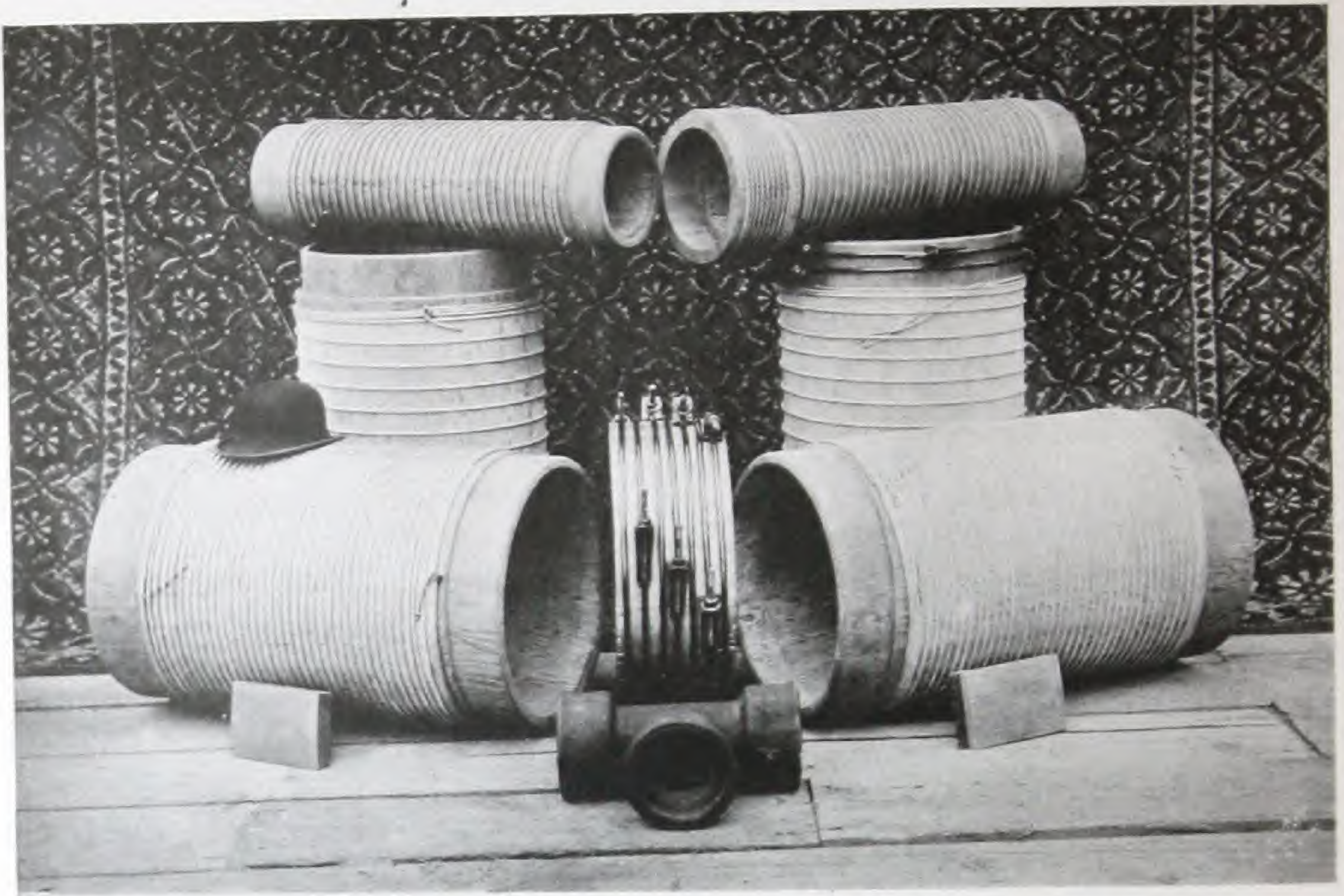
Redwood tanks are used in copper mines, where strong solutions of destructive acids are necessary in refining processes; in chemical works, tanneries, breweries, soap factories and other manufacturing processes where the tank is called upon not only to stand up under years of service, but remain unaffected by the contents. There are thousands of Redwood tanks in use for water storage, in wineries, for oil, fire protection, railroads, etc.

Redwood tanks, as well as pipe, are not injured or affected by arid climates or extremes of temperature. Redwood wears evenly under all sorts of service.



Redwood vats at plant of the Krieg Tanning Company, San Francisco, in service since 1852. Note the bored Redwood feed pipes to carry solutions used in the tanning process

WILL NOT SHRINK, SWELL OR WARP



Some machine banded wire wound Redwood pipe

Pipe and Flume

For pipe and flumes there is really no competition with Redwood, where permanency in installation and the highest type of service are demanded.

Redwood makes a superior stave for pipe. There are many Redwood stave pipe lines in operation today that have been in continuous service from 20 to 30 years, and show, under careful examination, no appreciable signs of decay. The average life of Redwood stave pipe is not definitely known. The original installations made in 1886, 1889, and succeeding years, are still in practically as good condition as when installed; and it is fair to assume that the ultimate life of a well-built Continuous Stave Redwood pipe is from 60 to 75 years.

Redwood is a non-conductor of heat and cold; 2 inches of Redwood

is equivalent in insulating power to approximately 30 inches of steel or concrete. This is an element of high importance in the stave for this use because it preserves the temperature of the contents of pipe.

Redwood staves are made from clear heart straight-grain stock and come in standard sets of 6 to 9 and 10 to 20 feet in length.

On large installations the cost of Redwood pipe is about one-quarter the cost of cast iron, and from 25 to 33 per cent less than steel. At the prevailing price of cast iron pipe (in May, 1917) a 24-inch Redwood pipe line would cost about 25 per cent of a cast iron line of the same size, while a 60-inch cast iron pipe line would be entirely out of the question, as cast iron pipe is not made in that size.

Redwood pipe is used as main

R E S I S T S F I R E A N D R O T

C A L I F O R N I A R E D W O O D

lines for municipal water plants, penstocks for hydro-electric plants, in mines where drainage water is not only hot, but carries mineral and chemical solutions detrimental to metal and other kinds of wood pipe; for sluicing, conduits, sewerage disposal, irrigation systems, etc.

Redwood pipe installations are made from 2 inches up to 13 feet in diameter. It is made in two forms—"machine banded" and what is known as "continuous stave" construction.

"Machine banded" pipe is made in completed sections, in standard length of 6 to 20 feet, from 2 to 32 inches in diameter, and is shipped ready to be laid.

"Continuous stave" pipe is a built-up installation, and is usually used for lines above 20 inches in diameter and up to the largest size. It is shipped to the installation as staves. The stave arrangement is staggered, and the ends splined. This gives a continuous pipe line that is best adapted for long lines conveying large volume of water.

"Continuous stave" installations can handle, in large pipe a pressure head of about 350 feet, and in smaller diameters it can be installed with strength sufficient to carry 400 feet head. "Machine banded" pipe can be made with a guarantee to withstand a static pressure of 800

feet. There are lines in Nevada carrying 500 feet head, which is 216 pounds to the square inch.

Redwood pipe in service and cost offers these distinct advantages over metal:

Costs less than any other pipe of equal efficiency.

Has a life equal to any other pipe except cast iron.

Will survive many replacements of steel hoops or wire bands even when the hoops or bands are heavily galvanized or coated with asphaltic.

Carries from 10 to 20 per cent more water than any other kind of pipe when both are new, and from 30 to 50 per cent more when both are 10 years old.

Flow capacity is not interfered with by accumulation of blisters and other foreign matter on the inner walls, such as in metal or concrete pipe, and which accumulation decreases the flow by increasing friction.

Not affected by electrolysis.

Not attacked by worms or insects, including the notorious white ant of the tropics.

Not affected by soils, which in many instances destroy other pipe.

Will not freeze under a temperature that bursts a metal pipe. If the water freezes, the flexibility of the pipe will prevent bursting. It neither expands nor contracts with heat or cold, therefore does not require expansion joints.

Not afflicted with temperature cracks such as occur in cement or concrete pipe.

Water is not discolored, stained or tainted, and it remains cool even when the pipe is laid on the surface in hot climates.

Redwood is a non-conductor of heat, and hot fluids and hot water can be pumped through it with a minimum of radiation.

Easily transported, particularly in rough or mountainous country, in "knock-down" shape.



Eight-foot Redwood continuous stave pipe used as inverted syphon by U. S. Reclamation Service at Gilman, Cal. Resting on cradles in heavy rock cut, and built on 600-ft. radius vertical curve

WILL NOT SHRINK, SWELL OR WARP

A Redwood pipe is the highest type of service durability. As the durability of Redwood staves is 5 or 6 times that of naked steel hoops, it is usual to protect hoops with asphaltic or other protecting coatings. There is no definite rule as to the life of the steel band on a Redwood pipe. That depends entirely on the character of the soil that the pipe lies in. If it is salty it will attack the steel much more quickly than an installation in clay. In making Redwood-pipe installations, the pipe companies investigate the bed for the pipe very thoroughly and the pipe is equipped with protected hoops to give it the maximum life.

Irrigation Boxes and Head Gates

Irrigation boxes and head-gates are built of Redwood, to get the Redwood service in long life.

The same applies to drainage and sluice boxes.

Redwood is being successfully used in California instead of porous tile to drain farm lands. This is usually done by making a 3-sided box of 1 x 12-inch boards, and setting the open side down. In this use it will last 15 years or more.

Read the experience of a practical farmer :



This Redwood pipe line operates under a head of 100 feet, and was installed for the city of San Diego, California

R E S I S T S F I R E A N D R O T



Redwood irrigation boxes in California

STANDISH & HICKEY LTD.

San Francisco, Cal., July 7, 1916.

Sec'y California Redwood Assn.,
San Francisco.

DEAR SIR:

Referring to yours of July 6th, regarding use of Redwood boxes for drainage on my ranch—

I have found it profitable to use Redwood boxes in several thousand feet of drains. The ditches are about five feet deep; the soil is of such character they would rapidly fill unless tile or some substitute was put in.

Knowing the lasting qualities of Redwood in the ground, we have put in boxes, without bottoms, using a No. 2 grade of common Redwood, without sap.

The interior capacity of the boxes would run from 36 to 100 square inches.

The cost of this box, compared with tiling, is far cheaper, and, of course, the boxes can be much more expeditiously laid.

Respectfully yours,

MILES STANDISH.

The great durability of Redwood in contact with wet ground, in addition to its light weight and ease of working, puts it, as far as the California country is concerned, in a class without competition for this purpose.

Concrete Forms

For concrete form lumber Redwood is exceptionally valuable because it does not curl or shrink, and can be used over and over again.

This is particularly true in hot climates where the sun, beating against the outside of the concrete form, warps other lumber by drying the exterior faster than the inside of the form board that is next to the wet concrete.

It has been found by actual experience with Redwood for concrete form lumber that—

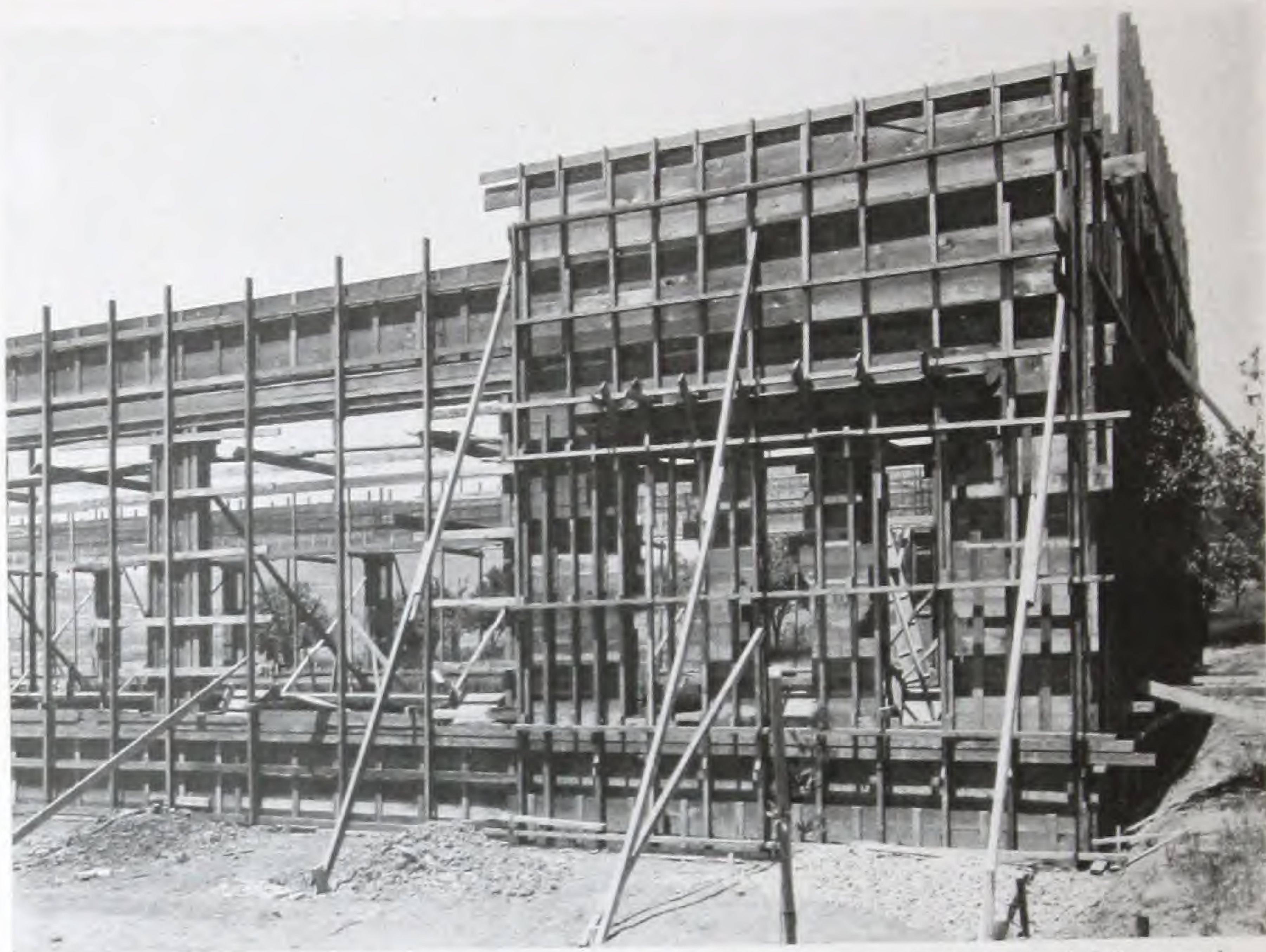
It strips better.

Can be used over and over because it does not change its shape.

It is easier and cheaper to handle by the carpenter.

By tonguing and grooving the form lumber better results are secured, giving a tighter form and a smoother concrete job.

WILL NOT SHRINK, SWELL OR WARP



Redwood makes the finest kind of lumber for concrete forms because it does not shrink or curl. Redwood forms increase contractors' profits. Rubber tire plant of V. K. Sturges Co., Oakland, California

Redwood is particularly recommended for wall and floor work.

For building residences, where concrete foundations are provided, a big saving in the construction cost is possible by using Redwood boards for the concrete forms for the foundations and later using the same boards for sheathing the house.

It has for years been the universal practice of contractors to use Redwood for concrete forms in "footings," for pillars, etc., where the lumber is left in the ground and where Redwood will last indefinitely without rotting.

The following letters from contractors testify as to the high regard in which Redwood is held as a concrete form lumber:

GILDERSLEEVE CONTRACTING CO.

NAPA, CAL.

CALIFORNIA REDWOOD ASSN.,
San Francisco, Cal.

Your letter of February 9th received and you wish me to give you my reasons for preferring Redwood to . . . lumber for concrete work.

I have always used . . . lumber for all my work until last year, and for a part of my work I used Redwood and . . . mixed. I found that the Redwood stripped in much better condition than the . . . and were troubled very little from warping, while the . . . could hardly be used after lying in the sun for three or four days. I used the Redwood over four or five times and it was in better condition than the . . . after it had been used twice. We have very little trouble with Redwood warping after it is nailed in the forms; also the carpenters will work more Redwood than . . .

R E S I S T S F I R E A N D R O T

C A L I F O R N I A R E D W O O D

I employed Messrs. Bardwell & Zimmerman, of Calistoga, to frame my bridges at Ukiah last year. A few days ago I met Mr. Bardwell and he said the experience he had while on our job had thoroughly cured him from using . . . lumber for concrete; no more . . . for him for concrete building.

You may be sure in the future I shall give Redwood the preference, even if it should cost a little more; it might take a few more stiffeners, but it is cheaper in the end. Yours truly,

GILDERSLEEVE CONTRACTING CO.

CHRISTENSEN BROTHERS

OAKLAND, CAL.

CALIFORNIA REDWOOD ASSN.,

San Francisco, California.

Gentlemen: In answer to your inquiry of recent date as to why we used Redwood lumber for concrete forms on the Sturges Tire Factory in Oakland, California, we wish to state that it was the first job upon which we had done so and it was experimental with us.

We had often spoken of Redwood for concrete forms, primarily because it was easy to handle and soft for nailing, and we thought that after stripping it could be used a second or third time.

We are very pleased to say that the experiment far exceeded our expectations. The walls were twenty-two feet high and two hundred and eighty feet long, and after stripping we found no stains at all in the concrete walls and when the alkali came to the surface it shone as white and clear as any that has ever come through after using pine lumber. The dampness on one side and the exposure to sun and air on the other seems to affect the lumber very little, and causes no warping as in other timber, thereby giving a smaller percentage of waste.

For the above reasons we feel that in the future we shall use nothing but Redwood for forms, unless specified otherwise by the architect. Very truly yours,

CHRISTENSEN BROS.,

C. Christensen.



Redwood concrete forms on big construction work

WILL NOT SHRINK, SWELL OR WARP

C A L I F O R N I A R E D W O O D



Main Street bridge, Willits, California. The rot resistance of Redwood makes the floor and joist construction of this bridge good for many years. The floor joists are 3 x 16 "merchantable" Redwood; the rough flooring 2 x 8 "construction" Redwood; and the finished flooring is 2 x 3 "merchantable" Redwood. For a wearing surface the bridge is finished with road oil and screenings

R E S I S T S F I R E A N D R O T

Gutters, Curbing, Etc.

Large quantities of Redwood 3" x 12", merchantable grade, are used in California for curbing and gutters in street work.

It is extremely durable in this service, lasting from 15 to 20 years, and particularly useful for outlying sections of big cities and in small communities.

For lining cesspools, culverts, sub-surface drains, sumps, bulkheads, lagging, etc., Redwood can be depended upon for from 15 to 25 years of usefulness.

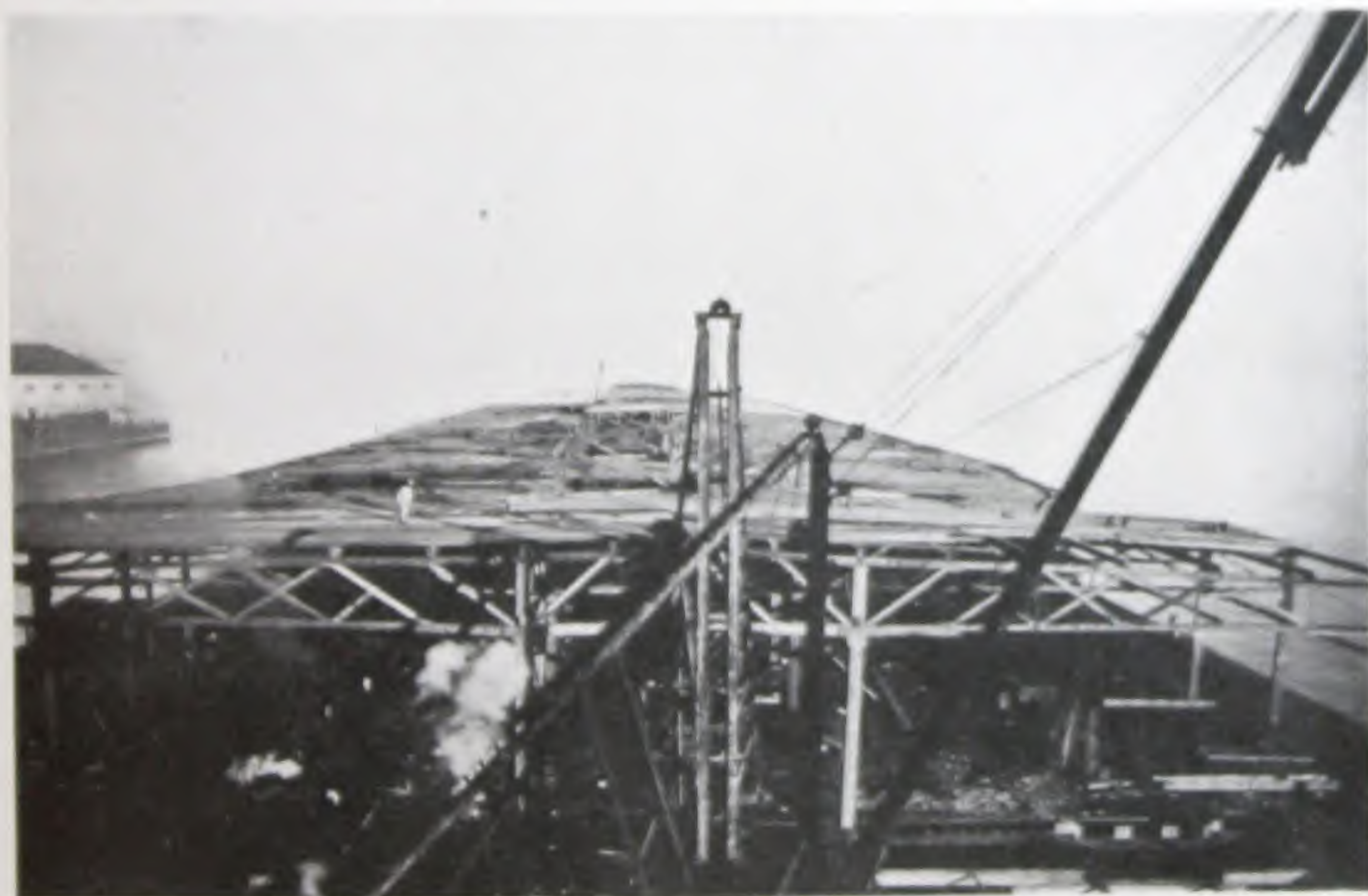
Many small communities find it to advantage to use wooden gutters and curbing where stone is not available. Most any other kind of wood for this service has to be creosoted, while Redwood can be put down just as it is taken from the lumber yard. It contains its own natural preservative.

Sheet Piling

Redwood's durability in contact with the ground makes it especially valuable for sheet piling. It is used in the west almost entirely for this purpose where driven in soil or sand.

It is sufficiently strong for this purpose, and, when once placed, it can be depended upon to last from 25 years upward, regardless of the condition of the soil or moisture. Redwood is so constituted by Nature that it has an equal resistance in almost any type of soil.

In the western country where drains, flumes, dams, sinks, septic tanks, bulkheads, sumps, etc., are common on every ranch or farm property, Redwood is always used because the first installation is regarded the final cost, not only in money, but in time and attention for many years.



Pier No. 46, San Francisco, in process of construction. Width, 160 feet; length, 760 feet; height, 30 feet, 38 feet at crown. Roof contains 326,000 feet 2 x 4 merchantable Redwood; sides 100,000 feet 2 x 10 extra merchantable Redwood ship lap siding.

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